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CONTENTS

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THE JOURNAL OF THE ALLENTOWN HOSPITAL is published each February, May, August, and November by the Staff and Trustees of the Allentown Hospital. Original papers are invited from all members of the Staff and will be reviewed for publication by the Editorial Committee. Papers submitted must be typewritten, double-spaced, on one side of the page only. Illustrations must be original drawings or black and white glossy photographs. References should be listed alphabetically and should conform to the QUARTERLY CUMULATIVE INDEX MEDICUS: author's name and initials, journal, volume, initial pages and year. Papers should be submitted to the chairman of the committee, Dr. Kerwin M. Marcks, M.D., F.A.C.S.

MALARIA IN A RETURNED KOREAN WAR VETERAN

J. J. WENNER, M.D., Ph.D., F.C.A.P.
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Vivax malaria has frequently been observed in Korean war veterans for the first time long after their return to the United States, and many months after the cessation of antimalarial suppressive therapy. These cases have been relatively rare in this area, and the purpose of this communication is to present a case which has come to our attention in the Allentown General Hospital. The rather prolonged interval between onset and diagnosis is noted. Delay in the administration of adequate therapy often has the effect of converting a rather trivial ailment into a major sickness. When an illness is discovered in a veteran of the Army who has seen service in Korea, the possibility of Vivax malaria should always be entertained until it can safely be excluded.

CASE REPORT

R.V.H., a native born white male, 24 years of age, experienced the first symptoms of his illness on October 22, 1953. These consisted of pains in the spine, knees, and feet followed shortly by frontal headache, photophobia, severe chills, fever and finally, sweating. This episode lasted approximately eight hours. Following the attack he passed a small quantity of highly colored urine. After this he was extremely exhausted for a short time but rapidly recovered. He felt well until October 24, 1953 when he experienced a second attack, in all respects similar to the first. Identical attacks continued to occur in this periodic fashion, every other day with an interval of forty-eight hours between their onset. Prior to hospitalization the patient had a weight loss of 25 pounds.

This patient has suffered no injuries, has had no operations, and has not previously been hospitalized. His past medical history included attacks of measles and whooping cough in childhood.

He saw service in Korea during the years 1951-1952. Antimalarial suppressive therapy was taken weekly during the malarial season while in Korea and was continued upon his return to the United States until May 1953. He was discharged from the Army in June 1953, in good physical condition, and is now employed as a laborer in an industry involving plastics.

The patient was admitted to the Allentown Hospital on November 16, 1953. At this time the next febrile attack was expected the following day. Physical examination disclosed an enlarged spleen and an aortic systolic murmur, suggesting the possibility of subacute, bacterial endocarditis. The following day, as expected by the patient, a sharp rise of temperature occurred, reaching 104.8° F. within a period of four hours, and then subsiding to a normal level during the next four hours. During this attack a definite diagnosis of Vivax malaria was made by smears of the peripheral blood, and antimalarial therapy was instituted. Antibiotic therapy of all types had been withheld until this diagnosis was made.

The blood smear showed trophozoites and schizonts in various stages of development and an occasional gametocyte was seen. Freshly liberated merozoites also were present in small numbers. The blood examination confirmed the diagnosis suggested by the clinical history.

A moderate degree of anemia was present with a hemoglobin content of 54%, an erythrocyte count of 3,000,000 and a hematocrit of 36%. A slight leukocytosis with a normal differential count was noted. The serum bilirubin showed a slight rise with a reading of 1.85 mg./100 cc. Febrile agglutination tests were negative and blood cultures were found to be sterile.

The therapeutic agents utilized in this case were aralen and primaquine. Aralen, which is proprietary preparation of chloroquine, was given immediately following the diagnosis and continued for a period of four days, the total dosage amounting to 14 tablets. Primaquine, the most recent addition to the 8-aminoquinoline group of antimalarials, was also started at the same time in a dosage of one tablet daily and continued for a period of fourteen days. These measures were designed to cope with both the erythrocytic phase and the tissue phase of the disease. Chloroquine, [1,3,4] is very effective against the erythrocytic phase of tertian malaria but is inert against the tissue phase. Primaquine, on the other hand, is effective against the tissue phase but has little effect against the erythrocytic phase.

The pathogenesis and the immunological reactions [1,2], of tertian malaria have received considerable clarification in recent years, although much still remains obscure. Upon inoculation of a previously uninfected individual the organisms have been demonstrated in the peripheral blood for a short period of approximately one-half to one hour. The plasmodia then disappear from the blood and cannot be found during the succeeding 12 days. This period constitutes the primary tissue phase and the incubation period of the disease. It has

recently been shown that the organisms are located in the cells of the reticulo-endothelial system where they undergo a developmental stage involving multiple cell divisions. Prior to this developmental stage, the sporozoites are unable to attack the erythrocytes of the blood stream. Merozoites are finally produced which are capable of invading the erythrocytes and the erythrocytic phase of the disease is initiated. Within the erythrocyte of trophozoite develops into the schizont which finally becomes segmented leading to rupture of the red cell and liberation of the merozoites. The rupture of the red cell corresponds with the febrile paroxysm of malaria which is dependent on the liberation of a toxic substance which is present in the altered red cell or which may possibly originate from the malarial organism, itself. In simple tertian malaria the organisms within the erythrocytes mature and rupture at approximately the same time giving rise to the cyclic nature of the attacks. Occasionally, due to multiple infections, more than one cycle develops in the peripheral blood giving rise to paroxysms at shorter time intervals. The asexual merozoites, upon liberation, attack fresh blood cells and thus inaugurate a new cycle. Many of the freed merozoites are killed by the natural defenses of the blood stream. Others enter the reticulo-endothelial cells and give rise to the secondary tissue phase of malaria and are responsible for the relapses of malaria. A few of the trophozoites develop into the sexual form, the microgametocytes and macrogametocytes, which are capable of propagation within the body of the susceptible mosquito. The liberated merozoites are non-infective to the mosquito.

In addition to suppressive therapy, [3,4,6] the prolonged latent period is partly due to the great disparity in the immunological responses of the tissues and the peripheral blood. The blood develops a considerable degree of immunity to the malarial organism, whereas the tissue immunity usually remains at a very low level. These factors together with the relatively benign nature of malaria contracted in Korea help considerably in explaining the prolonged quiescent periods frequently observed.

This case is typical of the sporadic cases of tertian malaria that have been occurring in small numbers among returned veterans of the Korean war. The cases are infrequent but any metropolitan area in the United States can furnish isolated reports of such cases. The history of the present case is typical of the type of malaria that occurs in Korea. This form differs in some particulars from the Vivax malaria occurring in other countries. It is easily controlled by antimalarial drugs and the infection is easily masked by suppressive drugs. On the other hand the benign character of the disease tends to promote

its chronicity. These factors account for the clinical attacks of malaria which appear after a prolonged period following cessation of suppressive therapy. This interval in the present case amounted to about six months. The common Vivax malaria of the tropical and subtropical countries is due to the Chesson strain of Plasmodium vivax; whereas the malaria of Korea is caused by the St. Elizabeth strain.[3,4,5,6] The St. Elizabeth strain of Vivax malaria was originally endemic in the United States and was later introduced into Korea. Due to the low virulence of the organism, small doses of suppressive therapy usually mask completely the initial infection. Relapses[5] have occurred after suppressive therapy, eg. primaquine, which is effective solely against the tissue phase. Cases of clinical malaria relapse almost constantly when treated with drugs, which are effective against the erythrocytic phase of the disease only, such as quinine, quinaquine, chloroquine or paludrine. It has been shown that when these drugs are used in combination with primaquine in adequate dosage relapse is prevented in practically 100% of cases.[4,5,7]

SUMMARY

A case of Vivax malaria in a Korean veteran which first showed clinical symptoms long after the initial infection and many months following cessation of antimalarial suppressive therapy is presented. The pathogenesis and immunological aspects of Vivax malaria with reference to the use of chloroquine and primaquine as therapeutic agents are breifly discussed.

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LEIOMYOSARCOMA OF PERITONEAL CAVITY

H. B. ADAMS JR., M. D.

SARCOMAS are malignancies derived from any type of connective tissue, with variation in the degree of malignancy. They exhibit invasiveness generally more than carcinomas and metastasis via the blood stream rather than by lymphatics. Increased mitosis and hyperchromatism are other features. Microscopically it is impossible to tell the point of origin of the sarcoma and also often difficult to differentiate it from benign connective tissue tumors and from inflammatory tissue. It is characterized by rapid and irregular growth with secondary growths in other organs or adjacent tissues and a tendency to recur at the same site after removal. The rapid growth is responsible for the absence of a capsule, degeneration (mucoid), and the pressure symptoms. The vascularity and the thinnesss of the vessel walls accounts for frequent hemorrhage and liquefaction and spurious cyst formation as well as the profuse bleeding met when the tumor is cut into at operation. It also explains the blood stream spread with the lungs and the liver common metastatic sites, the latter when an organ drained by the portal system is involved. Few lymphatics are found in these neoplasms and rarely are lymph nodes involved.

Grossly sarcomas are usually bulky without sharp encapsulation, fleshy on cutting, homogenous, and in color vary from gray to pink depending on hemorrhage or degeneration. Microscopically they are very cellular with a scanty stroma and thin walled blood vessels, but the framework is always present and the tumor is usually very vasccular. The cells are in sheets in sarcoma and the mitosis usually are numerous. MacCallum describes three types: a spindle cell resembling embryonic tissue; a mixed type with different sized and shaped cells and less orderly arrangement; and lastly a round cell variety with small or large cells and this the most malignant type. Boyd groups them as either embryonic, composed of large or small round cells and mixed cells, or a differentiated less malignant type as the fibro and myxo and osteogenic sarcomas. Some authors believe that myomatous and melanotic malignancies should not be called sarcomas as they are not connective tissue. The rapidity of growth of sarcomas leads to necrosis of the cells farthest from the blood vessels and this gives the microscopic appearance at times of a collar of cells around the vessels.

Leiomyosarcoma is a malignant growth derived from smooth muscle, most commonly the uterine wall but also from the intestinal wall, stomach, bladder and kidney. They behave like sarcomas generally in most respects as local invasiveness and recurrence and vascular rather

than lymphatic spread. They must be differentiated from lymphosarcomas, myomatous neoplasms not being generalized nor radio sensitive and tending to recur at the site before metastasizing. There are three theories about the pathogenesis of these tumors; (1) the embryonal rest theory of Conheim; (2) degeneration of a leiomyoma; (3) malignancy from the beginning. Sarcomas are said to comprise 3 per cent of G.I. malignancies and lymphomatous malignancies are more common than myomatous ones so that leiomyosarcomas are rare tumors. Fatality is due to the metastases.

Grossly leiomyosarcomas are homogeneous, grossly circumscribed, vascular tumors showing hemorrhage and degeneration with color from gray white to reddish. Microscopic findings are spindle shaped cells somewhat like fibroblast in streams and whorls with oval or cigar shaped nuclei frequently in palisade formation, but sometines the nuclei are large and bizarre shaped, and some multinucleated cells are found. Mitosis and hyperchromatism are frequently found. The stroma is scanty as a rule and usually many thin walled vessels are present. Stout suggested diagnosing mailgnancy on the basis of two mitoses per high power field. The microscopic picture shows the invasiveness of these tumors as the anaplastic cells blend in with normal tissue and there is no real encapsulation, so these tumors require wider excision than carcinomas but lymphatic spread excision is not usually so important. Fresh operative specimens should be stained with Mallory's phosphotungstic acid to show the pathognomonic myofibrillae. Von Giesons picro-fuchsin stains the muscle greenish yellow. These tumors may be difficult to classify microscopically. The more cellular the tumor and the more anaplastic the cells, the poorer is the prognosis.

The symptoms vary somewhat according to the organ and the location in the organ, but the rapid growth of many of these especially the large size cause pressure symptoms and pain is noted very early. Weight loss, anemia and cachexia are other frequent findings. In the bowel these tumors often involve the "meso" causing pressure in the main venous trunks and resulting in ascites and lower extremity edema.

In the small bowel it is rare but found most in the third position of the duodenum and the ileum and arises in the muscularis or more rarely in the muscularis mucosa. These usually grow outward but may grow inward with resulting melena and intussusception and massive hemorrhage has been recorded. In the small bowel the tumor is reported to grow more slowly with local infiltration, metastasis to the liver being uncommon. In the colon the commonest site is the lower sigmoid and the tumor growth is faster than carcinoma and the mass is larger and

more often palpable. Here pain is early, severe, and cachexia is more marked. In the bowel the tumor may infiltrate along the bowel wall much like a "linnites plastic" without projecting into the lumen. If it projects into bowel lumen ulceration causes bleeding.

Sarcoma of the rectum is a large lesion with ulceration of the musoca. Tenesemus, change in bowel habits, and bleeding are present as well as pain and cachexia. In a series of ten cases there was 100 percent fatality. In the lower colon and rectum local excision results in recurrence regardless of the grade of the malignancy. All submucous nodules in the rectum should be biopsied and if sarcoma, wide excision is required. Leiomyosarcomas of the colon and rectum are rare.

Leiomyosarcoma of the ovary is extremely rare, believed by some to arise from ovarian stroma. It is sometimes impossible to determine whether the origin is the ovary or the broad ligament. It is highly malignant and is found as an invading mass to the surrounding tissues giving a fixed pelvis and causing symptoms by pressure on the colon, rectum and bladder. Sarcomas of ovary require radical surgery plus irradiation in operable cases. The uterus is frequently the site of leiomyomas (fibroids) and sarconatous degeneration may result in a highly malignant tumor. It is one-fortieth as common as carcinoma, usually unilateral, and of the spindle cell type.

I am presenting a case of a 60 year old white female who was first admitted to the Allentown Hospital July 17, 1951 complaining of a three year increase in the size of her abdomen, increasing constipation, dyspareunia, and recently dyspnea, orthopnea and ankle edema. No vaginal bleeding noted since menopause 13 years ago. Examination revealed slight dyspnea, pallor, huge abdomen with varicosities and a large smooth firm mass from pelvis to just below xyphoid and simulating full term pregnancy. The mass was non-tender and freely moveable; the liver was not enlarged; but a fluid wave was present. The cervix was ecchymotic and it was impossible to palpate the uterus. The extremities showed two plus edema. Sigmoidoscopic negative for 10 inches, and colon x-ray was negative as was the chest and spine for metastasis.

After the usual preoperative care, including proper chemotherapy and the antibiotics, laparotomy was done on July 22, 1951 thru a lower left paramedian incision under spinal anesthesia. A moderate amount of clear ascitic fluid and a huge solid tumor filling most of the peritoneal cavity, fused with both ovaries and the intestines, was found. There were also several fist-like metastatic lesions adherent to the top of the uterus, sigmoid colon and small bowel with a long loop of distal

ileum embedded in the mass. The meso-appendix, colon, distal ileum and peritoneum were involved with small papillary projections. Excision of the mass with bilateral oophorectomy and excision of the larger metastasis with removal of the appendix and the involved ileum and involved colon was performed. And end-to-side ileo-colostomy (ascending colon), closure of ileocolic junction where ileum was transected, and closure of sigmoidotomy after a tumor removal was carried out. Patient made an uneventfuly recovery. Pathologic report was leiomyosarcoma with ascitic fluid positive for malignant cells.

Patient well till December, 1951 when abdominal pain and swelling reappeared and in January, 1952 a laparotomy was done elsewhere for obstruction (no nausea, vomiting, or colic was present and there was no cessation of bowel movements). Roentgen therapy was given pre and post-operatively with no apparent effect. Progressive anorexia followed plus nausea, vomiting, increasing abdominal distension and abdominal pain. The pain finally extended to the back and then weakness, a 20 pound weight loss, heartburn, dyspnea and ankle edema followed.

She was readmitted to the Allentown Hospital on June 30, 1952 when examination showed pallor, apical systolic murmur, occasional extra systoles and a very distended abdomen with generalized tenderness present especially in the epigastrium and left lower quadrant. A very large nodular, slightly tender mass in both upper and left lower quadrants, moving on respiration but not extending to the costal margins, was palpated. Smaller masses were felt in other quadrants. Liver and spleen not palpated. Dullness present over abdomen except for right flank and right lower quadrant which were resonant. No shift of dullness or fluid wave was demonstrable. Pelvic examination revealed a tender cervix which seemed to be in close proximity to the lower abdominal mass. There was no vaginal bleeding or discharge and no masses were palpated in the rectum.

After usual preparation, on July 14, 1952, under spinal anesthesia through a right rectus incision exploration revealed; bloody fluid, generalized malignancy of peritoneum, omentum, with bowel enmeshed, a large abdominal mass and a large pelvic mass. Abdomen closed. Patient died October 18, 1952.

Post-Mortem Examination revealed; dilated renal pelvis and ureters bilaterally; abdomen filled with nodules of varying sizes but not specifically involving any organ; two large masses of adherent nodules with the bowel enmeshed in same, the larger in the abdomen, the smaller in the pelvis. Nodules apparently encapsulated, firm,

whitish in color with areas of bloody fluid and necrosis. Liver, spleen, lungs and lymph nodes not involved grossly.

Microscopic Examination — tumor of fusiform cells which are fairly uniform and of only moderate size. Along with fibers they are arranged in interfacing bundles having a very definite resemblance to normal smooth muscle. Nuclear palisading is seen. An average of two to three mitotic figures are seen per high powered field — definite evidence of malignancy. Diagnosed — Leiomyosarcoma.

Summary: Sarcoma and especially leiomyosarcoma of intestines and female genital tract are reviewed and an interseting case of leiomyosarcoma (generalized) involving the peritoneal cavity is presented. This interesting case demonstrated local invasiveness and possibly "kiss cancer" while no involvement of lymph nodes, liver, spleen or lungs was demonstrable. Pressure symptoms on abdominal organs and on venous trunks were prominent.

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REPORT OF ANESTHESIA DEPARTMENT

RUTH N. BROWN, M.D., F.A.C.A. and MARY HINTERLEITER, R.N.

The Department of Anesthesia of the Allentown General Hospital reports the giving of 10,077 anesthesias and analgesias in 1953. Of these, 8,121 were given for surgical procedures and 1,957 for obstetrical procedures. Caesarean sections are included with surgical procedures only.

TABLE I
Procedures Requiring Anesthesia 1953

Surgical Procedures:	
Private	903
Semiprivate	5,125
Ward	2,062
Out-patient	31
Total	8,121
Obstetrical Procedures: (exclusive of Caesarean Sections)	
Private	136
Semiprivate	1,352
Ward	468
Total	1,956

Procedures requiring anesthesia in 1953 — 10,077.

The agents used for these 10,077 procedures are found in Table II which shows the number of times and the percentage of cases in which each agent was used.

TABLE II
Agents Used in 1953
(alone or in combination)

Agent	*Surgery*	*Obstetrics*	*Total*	*% of 10,077 procedures*
Inhalation Agents:				
Divinyl Oxide	1	0	1	.01
Ethyl Ether	2,823	1,186	4,009	39.7
Ethyl Chloride	1,299	0	1,299	12.8
Nitrous Oxide	3,914	1,880	5,794	57.4
Trichlorethylene	5	4	9	.09
Total	8,042	3,070	11,112	
Intravenous Agents:				
Thiamylal sodium (surital)	2,710	0	2,710	26.9
Thiopental sodium (pentothal sodium)	1,274	0	1,274	12.6
Total	3,984	0	3,984	

Muscle Relaxants:				
Curare	1,359	0	1,359	13.5
Succinylcholine	296	0	296	2.9
Syncurine	29	0	29	.2
Total	1,684		1,684	
Local Anesthetic Agents:				
(For spinal, local, nerve block, caudal)	3,018	138	3,156	31.3
Auxiliary Gases				
Oxygen	4,033	1,880	5,913	59.6
Spiritus Frumenti	3		3	
Total Agents	20,764	5,088	25,852	

An intravenous barbiturate was used as the principle agent in 44% of the surgical cases. No intravenous barbiturate is used for deliveries. Surital was used in 68% of the cases in which a barbiturate was used. Much less pentothal was used than formerly because of the use of surital. We felt that the advantage of surital over pentothal was that rarely did it produce laryngospasm and on these rare occasions, the laryngospasm was very mild. However, the advantage of pentothal over surital was that there was less nausea and vomiting following its use. Therefore, the last few barbiturate anesthesias in 1953 were induced by surital to produce less laryngospasm and maintained by pentothal to prevent nausea and vomiting. Since there are so few in this series, no conclusions can be drawn.

The majority of cases in which ether was used were children. The usual procedure was to induce with ethyl chloride and maintain with ether. Most of these cases were given oxygen, either under the mask when open drop technique was employed or added by means of a Y tubing to the ether vapor when using insufflation technique.

Succinylcholine, a new ultra-short acting muscle relaxant, was used in 296 cases. A report on this drug will be made in a later issue. The drop in the use of curare is due to the use of succinylcholine.

TABLE III

Anesthetic Combinations – 1953

Intravenous Barbiturate as Principle Agent:	
Pentothal with	
Nitrous oxide, oxygen	485
Nitrous oxide, oxygen, curare, ether	311
Nitrous oxide, oxygen, curare	145
Nitrous oxide, oxygen, ether	77
Nitrous oxide, oxygen, succinylcholine	69
Nitrous oxide, oxygen, syncurine	5
Nitrous oxide, oxygen, syncurine, ether	3
Nitrous oxide, oxygen, syncurine, succinylcholine	2

Surital with

Nitrous oxide, oxygen	1134
Nitrous oxide, oxygen, ether, curare	561
Nitrous oxide, oxygen, curare	324
Nitrous oxide, oxygen, succinylcholine	186
Nitrous oxide, oxygen, ether	182
Nitrous oxide, oxygen, syncurine, succinylcholine	8
Nitrous oxide, oxygen, ether, syncurine	5
Nitrous oxide, oxygen, ether, succinylcholine	5
Nitrous oxide, oxygen, syncurine	3

Surital induction and Pentothal maintenance with

Nitrous oxide, oxygen, succinylcholine	24
Nitrous oxide, oxygen	20
Nitrous oxide, oxygen, curare, ether	7
Nitrous oxide, oxygen, curare	4
Nitrous oxide, oxygen, syncurine, ether	2
Nitrous oxide, oxygen, ether	2

Total Intravenous 3,564

LOCAL ANESTHETIC AS PRINCIPAL AGENT

	Surgery	*Obstetrics*	*Total*
Spinal	1,055	15	1,070
Spinal, surital, oxygen	142	0	142
Spinal, pentothal, oxygen	63	0	63
Spinal, local	3	0	3
Spinal, surital, nitrous oxide, oxygen, curare	3	0	3
Spinal, pentothal, nitrous oxide, oxygen	1	0	1
Spinal, surital, nitrous oxide, oxygen, ether	1	0	1
Local (nerve block, infiltration and topical)	1,442	123	1,565
Local, surital, nitrous oxide, oxygen	69	0	69
Local, pentothal	40	0	40
Local, surital	14	0	14
Local, pentothal, nitrous oxide, oxygen	6	0	6
Local, nitrous oxide, oxygen	4	0	4
Local, ethyl chloride	1	0	1
Local, nitrous oxide, oxygen, ether	1	0	1
Local, pentothal, nitrous oxide, oxygen, syncurine	1	0	1
Total Local	2,848	138	2,986

INHALATION ANESTHETIC AS PRINCIPAL AGENT

	Surgery	*Obstetrics*	*Total*
Ether, nitrous oxide, oxygen	83	1,185	1,268
Ethyl chloride, ether, oxygen	1,265	0	1,265
Nitrous oxide, oxygen	57	691	748
Ether, oxygen	172	1	173
Ether, local	128	0	128
Ethyl chloride	34	0	34
Trichlorethylene, nitrous oxide, oxygen	4	4	8
Ether, surital, oxygen	2	0	2
Trichlorethylene, air	1	0	1
Ether, vinethene	1	0	1
Ether, ethyl chloride, nitrous oxide, oxygen	1	0	1
Total Inhalation	1,748	1,881	3,629

Techniques are reported in Table IV. Therapeutic blocks done on the ward by interns, residents, or surgeons are not included in this table. Practically all of the nerve blocks in this report are brachial plexus blocks for anesthesia.

TABLE IV

TECHNIQUES

	Surgery	*Obstetrics*	*Total*
Inhalation:			
Open drop	1,487	1	1,488
Semi-closed	3,699	1,882	5,581
Closed	3,099	0	3,099
Endotracheal	675	0	675
Insufflation	905	0	905
Oropharyngeal 837			
Nasopharyngeal 68			
Total	9,865	1,883	11,748
Regional:			
Spinal	1,292	15	1,307
Single dose 1271			
Intermittent 21			
Local	1,678	0	1,678
Nerve block	53	123	176
Refrigeration	2	0	2
Total	3,025	138	3,163
Intravenous	3,872		3,872
Rectal	12		12

TABLE V

ENDOTRACHEAL ANESTHESIA – 1953

Head and neck	254
Extra thoracic operations	18
Intra thoracic operations	28
Operations on G.I. Tract	239
Orthopedic operations	15
Neurologic operations	3
Gynecologic operations	50
Miscellaneous	68
Total	675

The type of operation for which endotracheal anesthesia was given is found in Table V. The majority of operations listed under miscellaneous were operations in which prone or other difficult positions were to be used.

Inhalation anesthetics were employed in 93% of obstetrical cases in which anesthesia was given. Surgical anesthesia was produced in 1953 in a variety of anesthetic combinations in which the principal anesthetic was an intravenous agent in 44%; and inhalation anesthetic in 27½% and a local anesthetic (local, block and spinal) in nearly all of the remaining cases. A variety of techniques were used, the principal indication being the safety of the patient. These combinations of agents and techniques have proved safe and satisfactory in our hands.

DEFICIENCY DISEASES

MORTON I. SILVERMAN, M.D.

DEFINITION: A lack of single or multiple nutritional elements without the adequate intake and utilization thereof, the human body suffers deleterious effects, prevents the consummation of its normal activity and results in a series of symptoms leading to a disease state.

Our thinking, nutritionally speaking, is no longer confined to that of a few vitamin deficiences, but encompasses, a constantly increasing number of ways in which we can become deficient. Therefore, our views must be broadened to include such divergent causes of deficiency as:

1. The body makes varying provision for the storage of necessary elements; e.g., high for the Vitamins A.B.D., low for Vitamin C (stored only in the adrenal in small amounts).

2. Nutrition is dependent on the vagaries of proper enzyme action for synthesis and degradation of essential foodstuffs; therefore postulating incomplete or inadequate utilization.

3. Insufficient intake of proper elements (age, poverty, dietary fads, special diets (Iatrogenic), poor dentures).

4. Increased catabolism (fever, inadequate caloric intake).

5. Poor digestion and absorption (Diarrhea, Malignancy, Achylia, Steatorrhea).

6. Increased need (Thyrotoxicosis, Pregnancy and Lactation, Growth).

In addition to these generalities, we must include such apparently unrelated deficiencies as:

1. Lack of Vitamin B_{12} resulting in incomplete R.B.C. maturation (therefore, lack of a vitamin now has more far-reaching implications than heretofore dreamed of).

2. Lack of Insulin (a hormone with enzymatic properties) resulting in a severe metabolic upset with its train of complications.

3. Lack of proper proteins in the diet — which will result in disturbance of the integrity of the liver cell and its multiplicity of functions.

These are but a few of the myriad of body processes which depend on the proper amount, absorption, and utilization of the elements necessary to nutritional homeostasis. This is all in addition to the more firmly accepted and established concept of a simple lack causing a simple syndrome (e.g., avitaminosis). Any serious break in the necessary chain of events that is more than temporary, can therefore eventuate into serious and at times irreversible and irremediable illness.

What are the criteria that we can apply in judging that a deficiency state is present? Kruse* postulates that there are two critical tests for validity of a typical localized lesion as a specific sign of nutritional, bodily, and particular nutrient deficiency are its experimental induction and response to therapy. Its acceptability in these respects is not demonstrated without fulfillment of the first three of the following stipulations, preferably all four:

"1. In an appropriate species of animal the sign is experimentally induced under conditions in which a specific dietary deficiency is a major influence.

"2. In animals the experimentally induced sign recedes and disappears with provision of the missing nutrient.

"3. In man the naturally occurring sign recedes and disappears with provision of the appropriate nutrient at a therapeutic level for a sufficient time. For the acute form the first positive response should be followed alternately by induced relapses and positive responses to therapy.

"4. In man the sign is experimentally induced under conditions in which a specific dietary deficiency is a major influence.

"Until a typical sign under these stipulations is shown to be related to more than one dietary essential it may be presumed to be specific for one."

What are the criteria by which we would consider an individual in nutritional homeostasis? The World Health Organization of the United Nations defines health as a "state of physical, mental and social well-being and not merely the absence of disease and infirmity". Good nutrition is essential for normal development and function of body organs; for normal growth, maintenance and reproductive activity; for maximum working efficiency; for optimum resistance to infection; and for the ability to repair injury to tissue. If these stipulations are fulfilled then one could be considered to be in a state of health.

* Quoted through permission of "NUTRITIONAL DATA" by H. J. Heinz Co.

In order to maintain the status quo in this respect, let us briefly mention those requirements which are considered basic:

1. Protein and Nitrogen Equilibrium — necessary for:
   a. Osmotic pressure of the blood
   b. Hb formation —
   c. Enzymes
   d. Some hormones
   e. Wound and fracture healing
   f. Repair and regeneration of parenchymal organs (liver)
   g. Manufacture of certain antibodies
   h. Weight gain
   i. Hastening of convalescence.

2. Amino Acids

   Lysine, leucine, iso-leucine, valine, threonine, methionine, phenylalanine, tryptophane. Absence of any one of these leads to negative nitrogen balance. These are the so called essential amino acids.

3. Carbohydrate:
   a. Important source of calories.
   b. Furnishes ½ of the energy output.
   c. Constantly used in all body processes (muscular metabolism C.N.S. metabolism, protective function on liver, spares protein).

4. Fat:
   a. Concentrated source of calories.
   b. Specific regulatory effect on protein metabolism.
   c. Absence of certain unsaturated fatty acids causes marked retardation of growth, skin lesions, increased BMR, and high water consumption. Even death may ensue.

   Essential — fatty acids, Linoleic, linolenic, arachidonic.

5. Caloric Content: Insufficient calories causes body to deteriorate.
   a. Severe starvation causes decreased BMR (may decrease by 50%) (two-thirds due to shrinkage of the metabolizing mass of tissue and one-third due to decrease in intensity of metabolism). This leads to adaptation by reduced energy expenditure.

b. Overt vitamin deficiency disease if therefore rarely seen in total starvation, but more in conditioned malnutrition.

6. Vitamin Content: (will mention only the broad aspects and not specific deficiency syndromes).

   a. Are significantly concerned in all metabolic processes.

   b. Depletion of water soluble vitamins is relatively rapid.

   c. Depletion of fat soluble vitamins is relatively slow.

   d. Play specific though undetermined roles in protein synthesis and protein metabolism (particularly riboflavin, choline, pyridoxine, and thiamine).

   e. Function of liver in inactivating certain hormones is dependent on adequate vitamin and protein intake (steroid hormones with riboflavin deficiencies).

   f. Full effect of protein nutritional therapy cannot be achieved with insufficient B Complex; B_{12} seems to function in the methylation process; therefore sparing choline, methionine and folic acid.

   g. Adrenal Cortical function is intimately tied up with Vitamin C, as is also the Pituitary. Vitamin C may act through the adrenals on both carbohydrate and protein metabolic processes. Also there is a direct relationship between Vitamin C and the metabolism of phenylalenine and tyrosine.

   h. Choline affects methylation, therefore influences the metabolism of methionine. The average good quality mixed diet contains 300-600 mg. — enough to preclude the necessity for choline supplements.

Let us also briefly consider other extraneous factors in the evaluation of the nutritional status of a given patient.

1. Temperature — Cold causes caloric requirements to rise.
   Hot causes caloric requirements to fall.

2. Age — During growth periods need for calories is greater.

Child:	1– 3 years – 27 lbs.	1200 calories
	4– 6 years – 42 lbs.	1600 calories
	7– 9 years – 58 lbs.	2000 calories
	10–12 years – 78 lbs.	2500 calories etc, etc.

3. Sex — Women require fewer calories than men per unit of body weight.

   Female (physically active) 2400 calories
   Male (physically active) 3000 calories

   In injury the requirements rise equally for both.

4. Activity — Muscular exercise increased need for calories.

   Sedentary Female – 2000 calories
   Sedentary Male – 2400 calories
   Heavy Work Female – 3000 calories
   Heavy Work Male – 4500 calories

   During prolonged muscular effort, nitrogen catabolism may be increased.

5. Stress — may cause marked metabolic alterations. Fatigue, tension, lack of sleep, climatic stresses, anoxia, decompression sickness. Stress can precipitate diabetic acidosis in an otherwise well-controlled diabetic.

What do we mean when we speak of malnutrition?

Malnutrition may be:

1. Primary — a lack in sufficient diet (not common here).
2. Secondary — (conditioned malnutrition) — is controlled by endogenous factors. Usually an adequate diet is available.
   a. Actual interference with food intake (anorexia, febrile states, post-operative states).
   b. Selection of foods (lack of or poor fitting dentures, or chronic Gastro-Intestinal Disease).
   c. Inadequate make-up of restricted diets (treatment of obesity, biliary disease, diabetes, renal disease).
   d. Increased requirements over normal (Hyperthyriodism, Fever, Pregnancy and Lactation, Infection, Diabetes).
   e. Incomplete digestion (rare): pancreatic insufficiency in elderly people; Sprue in children.
   f. Interference with absorption:
      (1) Iron in achlorhydria.
      (2) Coeliac Disease (Idiopathic Steatorrhea, or Sprue). Large fat stools interfere with fat, carbohydrate and protein absorption, also fat soluble vitamins A.D.E.K. and can result in, for example, Rickets.

(3) Biliary disease — may simulate Coeliac Disease (K Deficiency).

(4) Severe Diarrhea (rapid transit).

(5) Chronic use of mineral oil, etc., sulfa drugs.

g. Inadequate utilization or metabolism.

(1) Uncontrolled Diabetes may lead to Vitamin A Deficiency (due to lack of carotinase in the Diabetic Liver).

(2) Diet high in Protein and low Carbohydrate causes changes of the flora of the intestine. Low carbohydrate flora causes low B_1 synthesis.

B Subtilis plus Coli Communior with high carbohydrate diet causes high B Complex; Gram positive cocci develop with low carbohydrate diet and are proteolytic in nature.

(3) Use of Insoluble Sulfa Drugs —used to sterilize Gastro-Intestinal tract. (Preoperatives) (occurs in 3 to 5 days) and the bacterial flora is destroyed. Vitamin B deficiency can occur in 5 days to 12 months, depending on the amount of dietary supplementation present.

(4) Hepatic Disorders.

h. Metabolic Abnormalities:

(1) Adrenal Insufficiency.

(2) Nephrosis with associated hypoproteinemia.

i. Inadequate Dietary Supplementation of Vitamins:

(1) Inadequate intake of foods with Vitamin plus normal endogenous production by bacteria may be insufficient; cause subclinical deficiencies.

(2) Inadequate intake plus inadequate endogenous production can lead to overt clinical deficiencies.

Proof of Endogenous production of Vitamins (B Complex)—

(1) Animals on Vitamin Deficiency diet allowed to eat feces did not develop Vitamin Deficiency.

(2) Analysis of feces showed the output of B Complex to be 5 to 30 times larger than the amount ingested.

Our entire concept of deficiency and related states must also take into consideration, as has already been intimated, the fact that the fusillade of magic therapeutic bullets with which we are constantly bombarding our patients are, in effect, double-edged swords. We are no longer dealing with simple lack of a nutrient substance. The complexities of the problem are compounded by growing numbers of man-made and man-induced deficiencies, brought on largely by eager therapeuticians. To wit: —

1. The Moniliasis of the Gastro-Intestinal tract produced by the use of mycins and pencillin.
2. The hypoprothrombinemia induced by the coumarin drugs.
3. The hypopotassemia produced during the treatment of diabetic acidosis by insulin (another deficiency state in its own right).
4. The serious electrolyte imbalances produced by prolonged pre- and post-operative surgical intestinal intubation and suction.
5. The deliberate destruction of tissue by the use of isotopes as in myxedema produced by I_{131} therapy, or the fatal bone marrow depression, caused by P_{32} in the treatment of Polycythemia Vera, – to mention only a few.

These and many more therapeutic developments which are flooding the market are forcing us, almost from day to day, to alter our ideas on this subject so that a major consideration in the introduction of a new addition to our therapeutic armamentarlum is whether or not it will create a problem more difficult to deal with than the original disease itself.

In Conclusion — some basic concepts in Deficiency Disease are presented. Reasons for their promulgation and mode of development are discussed. A rationale for their avoidance, and possible treatment when they occur is thereby inferred.

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